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Climate change and human influence

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A Met Office review of the latest climate research confirms our planet is changing rapidly and man-made greenhouse gas emissions are very likely to be the cause. Long-term changes in our climate system have been observed across the globe, from shifts in rainfall patterns to a decline in Arctic sea-ice. The changes follow the pattern of expected climate change and bear the 'fingerprint' of human influence, providing the clearest evidence yet that human activity is impacting our climate.

The review studies developments in climate science since the last IPCC report (AR4) was published in 2007. Sophisticated 'detection and attribution' methods have been used to identify long-term changes in our climate and then consider:

- whether they are being caused by natural variability — such as changes in energy from the sun, volcanic eruptions, or natural cycles such as El Niño?
- and, if not, is there evidence that human activity could be to blame?

Conclusions show the climate system is changing in a number of ways which follow the pattern of climate change predicted by computer models. The only plausible explanation is that changes are happening as a result of human activity, including man-made greenhouse gas emissions.

Peter Stott, Head of Climate Monitoring and Attribution at the Met Office, said: "Recent advances in observational data and the way it is analysed give us a better insight into the climate system than ever before. This has allowed us to identify changes in our climate and disentangle natural variability from the results.

"The science reveals a consistent picture of global change that clearly bears the fingerprint of man-made greenhouse gas emissions. This shows the evidence of climate change has gone beyond temperature increases — it is now visible across our climate system and all regions of the planet. Our climate is changing now and it's very likely human activity is to blame."

There is also some evidence that changes in rainfall patterns could be happening faster than expected. More work is needed to understand why and whether this implies future changes in rainfall could be greater than models predict.

Some of the observed changes covered in the review of climate science

- **Temperature increase** — global temperatures have increased by about 0.75 °C over the past century and 2000-2009 was the warmest decade on record. Human influence has been detected on every continent.
- **Changes in rainfall patterns** — wetter regions of the world (mid to high latitudes in the northern hemisphere and tropical regions) are generally getting increasing rainfall, and drier regions less rainfall.
- **Humidity** — surface and satellite observations show moisture in the atmosphere has increased over the last 20-30 years. This increases the amount of water that can fall in extreme rainfall, posing flooding risks.
- **Warming oceans** — temperature increases have been observed over the last 50 years in the Atlantic, Pacific and Indian Ocean basins. These cannot be attributed to changes in solar activity, volcanic eruptions or variations in ocean currents, such as El Niño.
- **Salinity** — the Atlantic Ocean is becoming saltier in sub-tropical latitudes. This is because of increasing ocean evaporation due to increased temperatures. In the long-term, ocean regions at higher latitudes are expected to become less salty due to melting of glaciers, ice sheets and increased rainfall.
- **Sea-ice** — summer minimum of Arctic sea-ice is declining at a rate of 600,000 km² per decade, an area approximately the size of Madagascar. While there has been variation from year to year, a long-term trend has been observed that can only be explained by human influences.
- **Antarctic —** there has been a small increase in Antarctic sea ice extent since the satellite record began in 1978. This small change is consistent with the combined effects of greenhouse gas increases and reductions in the ozone layer which cause increases in some regions, such as the Ross Sea, and decreases in others, such as the Amundsen-Bellingshausen Sea.

Read the full science paper — Detection and attribution of climate change: a regional perspective

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